

NEW COMBINATIONS IN NORTH AMERICA EREMOGONE (CARYOPHYLLACEAE)

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ABSTRACT

The following 18 new combinations in *Eremogone* are proposed: *Eremogone capillaris* var. *americana*, *E. congesta* var. *cephaloidea*, *E. congesta* var. *charlestonensis*, *E. congesta* var. *crassula*, *E. congesta* var. *glandulifera*, *E. congesta* var. *prolifera*, *E. congesta* var. *simulans*, *E. congesta* var. *subcongesta*, *E. congesta* var. *suffrutescens*, *E. congesta* var. *wheelerensis*, *E. eastwoodiae* var. *adenophora*, *E. franklinii*, *E. franklinii* var. *thompsonii*, *E. kingii* var. *plateauensis*, *E. kingii* var. *rosea*, *E. macradenia* var. *arcuifolia*, *E. macradenia* var. *ferrisiae*, and *E. macradenia* var. *kuschei*.

RESUMEN

Se proponen las siguientes dieciocho combinaciones nuevas en *Eremogone*: *Eremogone capillaris* var. *americana*, *E. congesta* var. *cephaloidea*, *E. congesta* var. *charlestonensis*, *E. congesta* var. *crassula*, *E. congesta* var. *glandulifera*, *E. congesta* var. *prolifera*, *E. congesta* var. *simulans*, *E. congesta* var. *subcongesta*, *E. congesta* var. *suffrutescens*, *E. congesta* var. *wheelerensis*, *E. eastwoodiae* var. *adenophora*, *E. franklinii*, *E. franklinii* var. *thompsonii*, *E. kingii* var. *plateauensis*, *E. kingii* var. *rosea*, *E. macradenia* var. *arcuifolia*, *E. macradenia* var. *ferrisiae*, y *E. macradenia* var. *kuschei*.

During preparation of the treatment of the Caryophyllaceae for *Flora North America* (Rabeler and Hartman, editors, in prep), the decision was made to recognize the genus *Eremogone* Fenzl (= *Arenaria* subgenera *Eremogone* (Fenzl) Fenzl and *Eremogoneastrum* F. Williams sensu McNeill 1962).

Nepokroeff and Wagner (pers. comm.; see also Nepokroeff et al. 2001) conducted a DNA survey of the Caryophyllaceae, using sequence data from matK and the rps16 intron. Over 79 species constituting 38 genera were included, with emphasis on the subfamily Alsinoideae. The phylogeny illustrated *Arenaria* (sensu McNeill 1962), excl. *Minuartia* and *Moehringia*) to be polyphyletic, with two major, distinct clades. While one clade includes members of four of McNeill's subgenera, including *Arenaria serpyllifolia* L., the type of *Arenaria*, and the genus *Moehringia*, the second clade includes seven species (five from subgenus *Eremogone*, three North American and two Asian, and two Asian members of subgenus *Eremogoneastrum*). Within that clade, *Arenaria bryophylla* Fern. (subg. *Eremogoneastrum* from Asia) clusters closely with *A. aculeata* S. Watson and *A. kingii* (S. Watson) M.E. Jones (subg. *Eremogone* from North America), suggesting that the relationships between the subgenera may also need exami-

nation. The results indicated that the *Eremogone* group, including both subgenera, is strongly supported as monophyletic.

Eremogone was treated by McNeill (1962) as a subgenus of *Arenaria* containing eight sections (64 species, our compilation; ca. 70 species (Zhengyi et al. 2001)) closely allied with subgenus *Eremogoneastrum* (ca. 22 species). Members of subgenus *Eremogone* are found from western Europe through Asia, east to southern Alaska and northwestern Canada, disjunct to southwestern Canada and the western United States. The composition of *Eremogone* sensu Ikonnikov (1990) excludes McNeill's monotypic section *Monogone* Maxim. (the Tien Shan Mountains and the Altai Region), two of the species from his section *Scariosae* (northern Iran and Turkish Armenia), and his sect. *Pungentes* (two species, Spain and North Africa).

As outlined by McNeill (1962), *Arenaria* subgenus *Eremogoneastrum* is confined to three centers with two species (*Arenaria hookeri* Nutt. and *A. franklinii* Dougl. ex Hook.; a third, *A. pinctorum* A. Nelson is a variety of the former) in western North America, the type, *A. festucoides* Benth., known from India, Pakistan, and China, and the remainder (ca. 6 species) Sino-Himalayan in distribution. Seventeen species are now known from China (Zhengyi et al. 2001); most are Sino-Himalayan, nine were published since 1979. Ikonnikov makes no mention of *Arenaria* subgenus *Eremogoneastrum* in either of his synopses of *Eremogone* (1973, 1990).

In North America, both Maguire (1947, 1951; treated in Maguire (1951) as *Arenaria* sect. *Pentadenaria* Williams) and Hickman (1971) recognized a broader concept of *Arenaria* section *Eremogone*, including the two western American members of subgenus *Eremogoneastrum* (*A. hookeri* and *A. franklinii*). Maguire treated those species as related to but of uncertain placement, while Hickman considered them to be intermediate between sections *Eremogone* and *Alsine* (= *Minuartia*). *Eremogone* as presented here is currently accepted in floras of Colorado (Weber & Wittmann 1992 and subsequent updates at <http://cumuseum.colorado.edu/>) and Wyoming (Dorn 2001).

Morphologically, *Eremogone* consists of woody based perennials with a caespitose or matted habitat, filiform to subulate leaves with scarious bases, stiffly erect or ascending flowering stems, and cymes that are open to congested or umbellate. This is contrasted with the remaining North American (north of Mexico) members of *Arenaria* (ca. 9 species), that are annuals or perennials with either a caespitose habit or ascending to trailing stems, broader (ovate to lanceolate, sometimes narrowly so) leaves, and flowers often solitary or in few-flowered, open cymes.

Ikonnikov (1973) and Holub (1974) both noted that a base chromosome number of $x = 11$ also distinguished *Eremogone* from *Arenaria* ($x = 10$). Of the approximately 30 species of *Eremogone*, as here defined, which have been counted, only three counts (including two for *E. fendleri* that appear not to have

been vouchered; that taxon was counted by Hartman (1971) as $2n = 44$) are not based on $x = 11$. Contrary to their notion, *Arenaria* s.s. is cytologically more diverse; while many counts are based on $x = 10$, counts based on $x = 11$ are known in two subgenera as well as five sections of subg. *Arenaria* (Rabeler, pers. compilation from standard chromosome atlases).

Most of the nomenclatural combinations for the 13 North American species of *Arenaria* to be included in *Eremogone* are available (Ikonnikov 1973, 1974; Weber et al. 1981); by contrast, only a few of the infraspecific taxa have the appropriate combinations (Weber et al. 1981; Dorn 2001).

The following combinations are needed for the genus *Eremogone* in North America in anticipation of the *Flora North America* treatment (Hartman, Rabeler and Utech, in prep).

***Eremogone capillaris* (Poir.) Fenzl var. *americana* (Maguire) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria capillaris* Poir. subsp. *americana* Maguire, Bull. Torrey Bot. Club 74:41. 1947. *Arenaria capillaris* var. *americana* (Maguire) R.J. Davis, Madroño 11:144. 1951. *Eremogone americana* (Maguire) Ikonn., Novosti Sist. Vyssh. Rast. 11:174. 1974.

***Eremogone congesta* (Nutt.) Ikonn. var. *cephaloidea* (Rydb.) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria cephaloidea* Rydb., Bull. Torrey Bot. Club 39:316. 1912. *Arenaria congesta* Nutt. var. *cephaloidea* (Rydb.) Maguire, Bull. Torrey Bot. Club 74:46. 1947.

***Eremogone congesta* (Nutt.) Ikonn. var. *charlestonensis* (Maguire) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria congesta* Nutt. var. *charlestonensis* Maguire, Bull. Torrey Bot. Club 73:326. 1946.

***Eremogone congesta* (Nutt.) Ikonn. var. *crassula* (Maguire) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria congesta* Nutt. var. *crassula* Maguire, Bull. Torrey Bot. Club 74:45. 1947.

***Eremogone congesta* (Nutt.) Ikonn. var. *glandulifera* (Maguire) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria congesta* Nutt. var. *glandulifera* Maguire, Amer. Midl. Naturalist 46:501. 1951.

***Eremogone congesta* (Nutt.) Ikonn. var. *prolifera* (Maguire) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria congesta* Nutt. var. *prolifera* Maguire, Bull. Torrey Bot. Club 74:47. 1947.

***Eremogone congesta* (Nutt.) Ikonn. var. *simulans* (Maguire) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria congesta* Nutt. var. *simulans* Maguire, Bull. Torrey Bot. Club 74:48. 1947.

***Eremogone congesta* (Nutt.) Ikonn. var. *subcongesta* (S. Watson) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Arenaria fendleri* A. Gray var. *subcongesta* S. Watson, Botany [Fortieth Parallel]. 5:40. 1871. *Arenaria congesta* Nutt. var. *subcongesta* (S. Watson) S. Watson, Bot. Calif. 1:69. 1885. *Arenaria subcongesta* (S. Watson) Rydb., Bull. Torrey Bot. Club 24:244. 1897. *Arenaria burkei* Howell, Fl. N.W. Amer. 1:85. 1897.

***Eremogone congesta* (Nutt.) Ikonn. var. *suffrutescens* (A. Gray) R.L. Hartman & Rabeler, comb. nov.** BASIONYM: *Brewerina suffrutescens* A. Gray, Proc. Amer. Acad.

8:620. 1873. *Arenaria congesta* Nutt. var. *suffrutescens* (A. Gray) B.L. Rob., Proc. Amer. Acad. Arts 29:295. 1894. *Arenaria suffrutescens* (A. Gray) A. Heller, Muhlenbergia 6:96. 1910.

Eremogone congesta (Nutt.) Ikonn. var. **wheelerensis** (Maguire) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria congesta* Nutt. var. *wheelerensis* Maguire, Bull. Torrey Bot. Club 74:48. 1947.

Eremogone eastwoodiae (Rydb.) Ikonn. var. **adenophora** (Kearney & Peebles) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria eastwoodiae* Rydb. var. *adenophora* Kearney & Peebles, J. Wash. Acad. Sci. 29:475. 1939.

Eremogone franklinii (Dougl. ex Hook.) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria franklinii* Dougl. ex Hook., Fl. Bor. Amer. 1:101. 1831.

Eremogone franklinii (Dougl. ex Hook.) R.L. Hartman & Rabeler var. **thompsonii** (M. Peck) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria franklinii* Dougl. ex Hook. var. *thompsonii* M. Peck, Torreya 32:149. 1932 ('*Thompsonii*').

Eremogone kingii (S. Watson) Ikonn. var. **plateauensis** (Maguire) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria kingii* (S. Watson) M.E. Jones subsp. *plateauensis* Maguire, Bull. Torrey Bot. Club 74:54. 1947. *Arenaria kingii* var. *plateauensis* (Maguire) Reveal, Great Basin Naturalist 35:344. 1975.

Eremogone kingii (S. Watson) Ikonn. var. **rosea** (Maguire) R.L. Hartman & Rabeler, comb. et stat. nov. BASIONYM: *Arenaria kingii* (S. Watson) M.E. Jones subsp. *rosea* Maguire, Bull. Torrey Bot. Club 73:326. 1946.

Eremogone macradenia (S. Watson) Ikonn. var. **arcuifolia** (Maguire) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria macradenia* S. Watson var. *arcuifolia* Maguire, Bull. Torrey Bot. Club 74:51. 1947.

Eremogone macradenia (S. Watson) Ikonn. var. **ferrisiae** (Abrams) R.L. Hartman & Rabeler, comb. et stat. nov. BASIONYM: *Arenaria macradenia* S. Watson subsp. *ferrisiae* Abrams, Ill. Fl. Pacif. States 2:151. 1944.

Eremogone macradenia (S. Watson) Ikonn. var. **kuschei** (Eastw.) R.L. Hartman & Rabeler, comb. nov. BASIONYM: *Arenaria kuschei* Eastw., Proc. Calif. Acad. IV. 20:140. 1931. *Arenaria macradenia* S. Watson var. *kuschei* (Eastw.) Maguire, Bull. Torrey Bot. Club 74:51. 1947.

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